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FOREWORD

The monthly progress reports, on which this Monthly Letter is largely based, are in the main very satisfactory and informing and every one of them is being read with interest by the Chief of Bureau and others. They are meeting in a large way the purpose for which they were designed, namely, a means, which has hitherto been lacking, of keeping administrative forces in Washington in fairly close touch with the work of the hundreds of technical assistants of the Bureau scattered throughout the United States and in foreign countries. It is our understanding that Administrative Memorandum No. 22 BE, dated February 9, 1931, has been placed in the hands of every such technical worker of the Bureau and that such supplemental instructions as have been issued have also gone to the workers.

With the object of giving individual credit and indicating individual responsibility, the request has been made that each substation or subproject leader prepare a separate report--all such reports to be accumulated and sent to Washington--rather than an edited and combined report from the head station. This gives opportunity, to the rank and file of the workers who hold such responsible positions as subproject or special subject leaders, not only for self-expression but also a chance to show their ability in condensation and clearness of statement.

In the use of monthly reports for news letter purposes, brevity of statement is a great help, and therefore when the nature of the work makes it desirable to present the information at some length, or perhaps in tabular form, a brief summarized statement may also be given. Readers of the Monthly Letter will note that an effort has been made in Washington to utilize extended statements by reduction and condensation, but it would be much more satisfactory and probably more representative of the thought of the writers if they would add such condensed statements.

It does not follow, because the report, or any portion of it, from any station or substation does not receive notice in the Monthly Letter, that it has not passed muster. There are space limitations, and the general plan is not to cover all work each month, but to make selections so that the work of all those in responsible charge of projects or subprojects will be presented from time to time.

C. L. MARLATT,
Chief of Bureau.

(November 28, 1931.)

DOCTOR HOPKINS REACHES RETIREMENT AGE

On August 31, 1931, Doctor A. D. Hopkins retired under the age limitation of the Retirement Act of May 29, 1930, and on Sept. 1 he was appointed collaborator without compensation.

Doctor Hopkins became associated with the Bureau in 1902 when as a special agent he was assigned to investigate certain forest insects. In July, 1904, he was placed in charge of the newly established Division of Forest Insects. In organizing and developing work of this division he laid the foundation for our future work in this important field and became generally recognized as the father of forest entomology in America.

More recently he became intensely interested in bioclimatics and in 1923 relinquished his connection with the Division of Forest Insects to devote his entire time to investigations in this field, which involve studies of the broader phases of the relations between insects and environmental conditions affecting their development and abundance. During these later years he has published a number of papers giving preliminary results of his observations and has done much to develop the science of bioclimatics. A more comprehensive publication on bioclimatics is now being completed and the first volume should go to the printer within the comparatively near future. The Department has given its approval to the outside publication of this work.

Although Doctor Hopkins has retired in accordance with provision of the law, such retirement is in name only. He is still both mentally and physically active and proposes to devote practically his entire time to the continuation of his investigation on bioclimatics. In appointing him as a collaborator the Bureau expects that he will maintain the same general relation to the work on bioclimatics that he has in the past.

Since his transfer to the field service in 1923 he has established, at his own cost, a laboratory and experimental grounds on his property on the Little Kanawha River near Parkersburg, W. Va., and he hopes that this will become a permanent station for the study of bioclimatics, not only in relation to insects and their control but in relation to plants and farm practices generally.

THE ADMINISTRATIVE BULLETIN

From this time on, notes on general administrative matters will probably occupy a minor place in the "Monthly Letter," as material of this kind is usually distributed through other channels, notably the numbered series of Bureau administrative memoranda.

It is believed, however, that the entire Bureau personnel could read with interest and profit the regular monthly issues of the Department's new publication, "The Administrative Bulletin." This paper contains not only a summary of current administrative orders and decisions, but discussions of many matters of common interest, such as the Retirement Act, the Saturday half-holiday legislation, etc., and many helpful suggestions on good business practice, both in the Federal service and in the commercial field.

DECIDUOUS FRUIT INSECTS

H. W. Allen and A. J. Warren, Moorestown, N. J., have completed the season's work on the experimental mass liberation of the parasite Trichogramma minutum Riley for the protection of mid-season and late peaches from the oriental fruit moth. Mr. Allen says: "In view of the wholesale rearing and liberation of this parasite, it is considered that our results are most interesting. It may be added that our liberations were made under the most nearly ideal circumstances obtainable, and probably under conditions much more favorable than would exist in large-scale practical operations. The table below (omitted) indicates that there was a slight reduction of fruit infestation in eight of the ten experimental blocks over their respective controls, but in only one instance was this reduction of significant proportions (14.1 per cent)."

In their work on recovery of parasites of the oriental fruit moth from peach twigs, H. W. Allen and Earl Lott, of the Moorestown laboratory, report: "The most interesting development for the month has been the finding of a Macrocentrus species closely resembling ancylivorus much more widespread and in larger numbers than heretofore suspected. This has been recovered from New York, New Jersey, Pennsylvania, Connecticut. Ohio, Virginia, and West Virginia. This species was especially abundant in collections from Orange and Rockland Counties, N. Y., having 68 per cent parasitism, other parasites 22 per cent, and host emergence but 10 per cent, Heretofore ancylivorus has been considered dominant in that area."

Summarizing a detailed report of biological studies of the peach borer (Synanthedon exitiosa Say), O. I. Snapp, of the Fort Valley, Ga., laboratory, includes the following statement: "The 59 females which completed their oviposition during the month of September deposited 35,989 eggs, or an average of 610.0 eggs per female. The 64 ovipositing females deposited a total of 38,551 eggs to September 30. The total number of eggs deposited per female varied from 36 to 1,257. One individual deposited a total of 826 eggs within a 24-hour period."

"The question as to the effect of the calcium arsenate, as used for controlling the blueberry maggot, upon birds, rabbits, deer, and other wild life has caused considerable discussion among blueberry growers and others associated with the blueberry industry," according to L. C. McAlister, jr., of Cherryfield, Me. "In an attempt to answer this, a cage containing two young domestic rabbits and a pen of four chickens was placed on a heavily dusted area of blueberries. The blueberries received three applications of calcium arsenate at the rate of 8 pounds per acre. The first application was made on July 6, the second on July 13, and the third on July 20. The rabbits and chickens were placed on the berries on July 14. The cages were moved every day to a new location, so that the animals were constantly in contact with a fresh source of arsenic. The animals were fed on a restricted diet so as to force them to feed on the blueberries. * * * The chickens consumed all of the berries and much of the foliage in their cage every day, and the rabbits not only ate the berries but also ate most of the blueberry plants. On August 16, after having fed for over a month on the heavily dusted berries, the animals were removed because the berries were being picked on that land. None of the animals suffered any ill effects from the calcium arsenate. The rabbits appeared to be more vigorous and in better health than before they had fed on the dusted blueberries. The chickens had actually gained one-half to three-fourths of a pound each as a result of feeding on the heavily dusted blueberries. While the results of this test may not apply to the wild animals, they do show that the calcium arsenate as used in the control of the blueberry maggot is harmless to chickens and domestic rabbits."

Investigations of the codling moth (Carpocapsa pomonella L.) at Wichita, Kans., during September, have consisted chiefly in checking injuries on sprayed blocks. P. M. Gilmer, who has had charge of this work, writes: "An examination of two trees from which all attacked fruit was stripped at the approximate completion of each brood, the fruit being left beneath to furnish the normal infestation for the succeeding brood, has shown quite conclusively that for three-brooded areas the usual check block of unsprayed fruit is valueless as a comparison basis owing to almost complete loss of fruit before the third brood comes on. The actual figures follow for one tree: First brood, total fruit 5,205, total injuries, 1,092; second brood, total fruit available 3,811, total injuries 2,885; third brood, total fruit available 674, total injuries 279. Since these trees were, as usual, unsprayed, it is readily seen that the quantity of fruit available for third-brood injury is so reduced as to give but little chance for the worms of this brood to find opportunity for entrance. The substitution of lightly sprayed blocks ought to give a somewhat truer idea of degree of infestation by checking all injuries as worms."

M. A. Yothers, of Wenatchee, Wash., reports that the parasite Aphelinus mali Hald., which earlier in the summer had been introduced into a tree infested with the woolly aphid which was surrounded by a cloth cage, "multiplied rapidly until by mid-September * * * it had destroyed many thousands of aphids and many other thousands were in the earlier stages of parasitism. It was decided to liberate a few of these parasites upon near-by trees in order that they might have a chance to establish themselves under normal orchard conditions before winter. Between September 22 and 29, inclusive, a total of 19,500 Aphelinus mali parasites were captured and liberated. * * * The parasites were collected from the inside of the cloth covering of the cage * * * in lots of 500 each, except for the first three lots, which had 1,000 in each of them. The parasites were released upon woolly aphid-infested trees in various parts of the district."

The following summary of fruit infestation counts of the oriental fruit moth in baited and unbaited areas at Vincennes, Ind., is given by W. P. Yetter, jr.:

Orchard	Variety	How baited	Solution	Per cent wormy peaches
Dyer	Elberta	Trap in every tree	Citral-molasses	1.73
Dyer	Elberta	Trap in every other tree	Citral-molasses	2.17
Check	Elberta	Not baited	None	5.10
Dyer	Hale	Trap in every tree	Citral-molasses	3.26
Dyer	Hale	Trap in every other tree	Citral-molasses	4.50
Check	Hale	Not baited	None	4.01
Simpson	Elberta	Trap in every tree	Methyl cinnamate-brown sugar	0.46
Simpson	Elberta	Trap in every other tree	Methyl cinnamate-brown sugar	0.37
Check	Elberta	Not baited	None	5.10
Simpson	Hale	Trap in every tree	Methyl cinnamate-brown sugar	0.97
Simpson	Hale	Trap in every other tree	Methyl cinnamate-brown sugar	0.25
Check	Hale	Not baited	None	4.01
Dyer	Hiley	Trap in every tree	Citral-molasses	2.05
Dyer	Hiley	Trap in every tree in every other row	Citral-molasses	1.67
There were no checks available for this variety				

JAPANESE BEETLE AND ASIATIC BEETLE RESEARCH

In the Monthly Letter for August, I. M. Hawley, of Moorestown, N. J., reported that Aserica castanea Arrow had been taken in large numbers in geraniol traps at Harrisburg, Pa. Mr. Hawley now writes: "To see if this was a real attraction, 9 traps were placed in the heavily infested region around Chestnut Hill on August 4. When these were discontinued on the 16th of September, 40,134 Popillia japonica Newm. had been taken and only 269 A. castanea. It would appear that geraniol has little, if any, attraction for A. castanea."

In reporting experiments on the influence of temperature on the development of the Japanese beetle, Mr. Hawley states: "Of the series of larvae hitherto reported as reared from eggs under conditions approximating those likely to be encountered in the extreme Southeastern States, the individual reported as having become a pupa on August 31 changed about two weeks later to an adult male. On September 1 this entire series, which had hitherto been kept in an incubator, was transferred to a cellar where temperatures approximating those of late autumn (67-75° F.) in the Southern States would be more likely to prevail than in an incubator. By September 30 no additional larvae had turned to pupae though some appeared to resemble prepupae. The series of larvae reared from eggs under out-of-doors conditions showed during the month changes parallel to those noted in nature. Most became third-instar larvae. The other series of larvae, previously noted as having been reared in an incubator at temperatures averaging slightly above normal, were mostly in the second instar at the beginning of September, but had nearly all changed to the third instar before the middle of the month."

J. L. King, of the Moorestown laboratory, reports the outstanding features of the month's work on parasites to be as follows: "In a series of experimental tests on the hosts which Prosena siberita Fab. will accept, it has been proved quite conclusively that P. siberita will not only accept Aserica castanea larvae as a host, but that when reared on this host two generations of flies are produced; normally with Popillia as a host one generation per year results. Similar tests using the native Serica parallela Csy. also gave two generations per year."

Experiments with eggs in soil treated with lead arsenate were conducted during the summer to obtain further information on the time required to eliminate infestation of the Japanese beetle after the egg was deposited in the soil, according to W. E. Fleming, in charge of insecticide investigations at the Moorestown laboratory. "The lead arsenate was applied at the rates of 1,000, 1,500, and 2,000 pounds per acre. The examinations were made 20, 30, and 40 days after the eggs were placed in the soil. * * * In some tests the infestation was eliminated within 20 days in soil treated at the rate of 1,500 pounds per acre, but 30 days were necessary to assure destruction of all larvae hatching from the eggs. These results are in agreement with those obtained in the season of 1929."

Experiments conducted by Mr. Fleming to determine the uniformity of distribution and the penetration of lead arsenate in uncultivated ground have been completed. He reports: "The application of lead arsenate as a dust to the soil gave the most uniform distribution. The analysis showed that the upper inch in the dusted plot had a concentration of lead arsenate over the entire surface which was sufficient to destroy the larvae of the Japanese beetle. When the lead arsenate was applied as a spray, the analysis showed that there was a tendency of the arsenic to collect in the low spots. In some cases 50 per cent of the area treated by the liquid method did not have sufficient lead arsenate in the upper inch to assure the destruction of the larvae. The lead arsenate penetrated, however, a little deeper into the soil in general when applied as a liquid spray."

The fairways of the Old Belleclaire Golf Club, Bayside, N. Y., which were infested last spring with Ochrosidia villosa Burm. in sufficient density to cause damage to the turf, were top-dressed with lead arsenate. The larvae have been observed this fall to be feeding beneath the poisoned soil, apparently unharmed by the treatment. This condition was also observed last fall in a lawn near New Rochelle, N. Y.

Reporting on investigations of control methods, Mr. Fleming writes: "In a cooperative experiment with * * * the New Jersey Experiment Station, approximately 1,500 eggs of the Japanese beetle were subjected to high-frequency waves. The frequency was varied from 1,000,000 to 5,000,000 cycles per second and the field strength from 1,000 volts to 4,000 volts, per square inch. The eggs were kept under daily observation after treatment until the final effect could be determined. In no treatment did the high frequency waves prevent all the eggs from hatching."

What the Japanese beetle is doing in northern Japan (Hokkaido) is of interest. L. B. Parker reports: "This year, 1931, was the normal year for 'beetle abundance' of Popillia japonica Newm. at Sapporo, due to the emergence of both the one-year and two-year cycle broods. According to the reports of entomologists of the Agricultural Experiment Station at Kotoni (near Sapporo) there was an unusual abundance of P. japonica this year, even for a year of beetle abundance. When the writer left Sapporo at the end of August the beetles were still quite abundant, though their feeding was confined almost entirely to their favorite food plants, Polygonum cuspidatum (itadori). The percentage of parasitism by C. cinerea at this time was very low indeed and appearance indicated that this parasite had completed its season's activity and that what few parasitized beetles were found were the victims of a few tardy individual flies."

Mr. Parker gives the following summary of the collecting, rearing, and shipping of Tiphia asericae Allen and Jaynes for 1931:

Total number of females collected..... 7,963
Total number of ovipostions obtained.....65,804
Total number cocoons formed.....31,662, or 48.12 per cent
Total number of healthy cocoons obtained 28,471, or 43.27 per cent

J. L. King, Moorestown, N. J., reports that on August 31 a shipment of 28,741 cocoons of Tiphia asericae Allen and Jaynes was received at the laboratory. The general condition of the shipment was good. When unpacked 3,091, or 21.1 per cent, of the cocoons were dead, due to fungus. The remaining 25,380 cocoons were transferred to vials set in trays and placed in the cold cellar for hibernation. Included in the above shipment were 286 cocoons of Tiphia malayana Cameron reared in Japan and Korea. Thirty-eight of these, or 13.3 per cent, were dead and the remaining cocoons are now held in storage. Since rearing experiments with Tiphia malayana, using grubs of Aserica as host, both in Korea and in Japan, seemed to indicate possibilities as a parasite of this pest in the United States, it was thought advisable to send a sufficient number for experimental purposes to Moorestown.

TROPICAL, SUBTROPICAL, AND ORNAMENTAL PLANT INSECTS

W. E. Stone, who has been continuing the survival studies of Anastrepha serpentina Wied. begun by Mrs. H. H. Darby at the Mexico City laboratory, reports: "The surviving adults * * * reported upon by Mrs. Darby prior to July of this year died during the month, the oldest attaining an age of 12 1/2 months. The population, according to Mrs. Darby's notes when the experiment was begun, was approximately 29 adults. We now have the following species under observation: A. serpentina, 15 adults over 10 months old; A. striata, 66 adults over 10 months old; A. fraterculus, 27 adults over 3 months old; and A. ludens, 17 adults over 13 months old. These records substantiate the former records as to the longevity of the four important species of Anastrepha obtained at this laboratory."

The symptoms of leafhopper injury to hollyhocks and marigolds observed on plants in the open have been reproduced experimentally with Empoasca fabae Harr. in the greenhouse at Washington, D. C., by F. F. Smith.

The vapor-sterilization treatments of commercial stocks of bulbs at Sumner, Wash., were completed at the end of September by Randall Latta. "The total amounts treated during the whole season are as follows: Laboratory equipment: 50 treatments, 320 tons; Van Zonneveld equipment: 33 treatments, 449 tons. * * * At the Van Zonneveld plant the treatment of one load was unintentionally continued over a period of 14 1/2 hours. * * * The retention of the heat (110° F.) for this period with no intake of steam demonstrated the high quality of the box construction. Samples of bulbs from this treatment show no signs of ill effects as yet. Root development is apparently going to be satisfactory. No external signs of injury were apparent on September 30 on bulbs treated at periods of 4-6-8-10-12 hours at 111° F. on August 17, nor on bulbs treated at temperatures up to 115° F. for 4-hour periods on August 29 and 30."

The fumigation tests with hydrocyanic acid continued during the summer by C. F. Doucette and H. D. Young at Sumner, Wash., "indicate very definitely that this gas does not penetrate sufficiently into a

special type of Eumerus-infested narcissus bulb to give mortality." This corroborates the previous finds of C. A. Weigel at Babylon, Long Island, in the summer of 1929. "A few (preliminary tests) with ethylene oxide for one-hour periods gave 100 per cent mortality of all Eumerus and Merodon larvae."

Mr. Doucette and Ralph Schopp report: "All stages of Liothrips vaneeckei Priessner are killed in the vapor sterilizer with treatments of lily bulbs for one hour or longer at 111° F. Paradichlorobenzene does not seem effective as a soil insecticide against the thrips in the bulbs in the ground."

A. W. Cressman, New Orleans, La., reports that fig trees "treated with paradichlorobenzene * * * are again infested with (three-lined fig-tree) borers (Ptychodes trilineatus L.) near the surface of the wood. The treatment therefore has been of no value."

Another shipment of citrus leaves infested with Aleurocanthus woglumi Ashby heavily parasitized with Eretmocerus serius Silv. has been received at the Panama Canal Zone laboratory from P. A. Berry of Cuba. James Zetek, of the Panama laboratory, says: "By the time these leaves reached us, they were at least five days old. Nevertheless quite a fair number of parasites were obtained and liberated." In regard to the results of previous parasite liberations, he says: "Parasites were liberated at Corozal last January, at height of dry season, and last month some leaves were taken and parasites emerged not only from leaves from trees right next to one where parasites were liberated, but also from trees fully a block away. At Fort Amador it is not difficult to get well-infested leaves of lime trees which are thoroughly parasitized, and many additional liberations were made from material obtained at that place. It is gratifying to note how well the parasite took hold and that it thrives here, and I believe I see a real change in the woglumi picture at Amador."

In connection with life-history studies of Anastrepha fraterculus Wied. and Toxotrypana curvicauda Gerst., Mr. Zetek has observed a difference in the behavior of the larvae of these two fruit flies. "Although the frateculus larva is mature 11 days after the egg was laid, it can remain within the fruit (mango) for some time longer, depending upon the condition of the fruit. * * * Larvae have been removed from fruit 13, 14, and even 17 days after oviposition took place. * * * This ability to remain within the fruit, quiescent, for some time after fully mature is an advantage. When the fruit drops to the ground it breaks open, giving the larvae the opportunity to escape and pupate. In the case of curvicauda this does not follow. The larvae can remain in the fruit (papaya) for some time after fully mature, but as a rule they work their way out of the fruit, fall to the ground, and pupate. They do not have to wait until the fruit falls. * * * By working their way out of the fruit many more reach pupation."

F. S. Stickney, Whittier, Calif., has conducted some tests to determine how successfully the date palm mite (Paratetranychus heterony-

chus Ewing) would survive on Bermuda grass. He describes these tests as follows: "Bermuda-grass shoots were planted in six pots, thoroughly cleaned of any possible pests and 20 to 50 date mites collected from date fruits were transferred to each one. * * * They settled immediately after being transferred, appeared to be entirely satisfied with their new environment, and within an hour the majority of them had turned from their normal creamish color on date palm to a distinct greenish hue. Eggs were deposited and within seven days they were beginning to hatch. The Bermuda grass was webbed up extensively, similarly to the way the mite webs up the fruit of the date palm. Indications are that they are living normally on the Bermuda grass."

F. R. Cole, Whittier, Calif., reports: "The mites previously reported as being on the leaves of gerbera have been determined by Banks as Tyroglyphus heteromorphus Felt.

At the request of Prof. Harry S. Smith, of the Citrus Experiment Station, Riverside, Calif., A. C. Mason, of Honolulu, T. H., has made two shipments of parasites of the Mediterranean fruit fly to that station "for the purpose of testing their usefulness in parasitizing the larvae of the walnut husk maggot, Rhagoletis completa Cresson. * * * The first shipment consisted of 100 adult Opius humilis and 900 adult Diachasma tryoni. * * * Half of the insects were placed in large test tubes, containing food, and held undisturbed in the vegetable room on the ship, at 50° F., and the other half were kept in the baggage room in care of the chief officer of the ship, who fed and cared for them each day en route. They were fed on honey and water placed in small droplets on rubber-tree leaves. The first lot arrived in almost perfect condition, while there was a heavy mortality among the others, due no doubt to lack of care by an inexperienced man. The second shipment consisted of 100 adult Opius and 1,000 adult Diachasma tryoni, and was sent entirely in the cold room at 50°F, since the success of the first shipment showed this method to be practical. They arrived in perfect condition. Both shipments were received at San Francisco by Prof. Smith, taken at once to southern California by airplane, and released the same day in the infested walnut groves."

Bearing on the susceptibility of the tomato to fruit fly infestation, Mr. Mason reports suspending two lots of tomatoes in an orange tree at the Hawaiian Experiment Station. He says: "The trap record in the tree for this 24-hour period showed a catch of 84 male flies. At the end of the 24-hour period the tomatoes were removed to the insectary and held in individual cans for 20 days. No larvae developed in any of them nor was there any evidence of oviposition punctures. The experiment was repeated September 2, with 12 tomatoes. * * * The experiments indicate that tomatoes are in no sense a favored host of the fruit fly. Even when placed in an ideal environment, such as an orange tree containing large numbers of flies, only 1 of 19 fruits was attacked. There were no oranges or other host fruits near the tree at the time, where oviposition might have taken place." Under forced conditions in cages the tomato serves as a fly host, but under field conditions rarely, if ever. The effort here was to determine whether natural infestation would take place in the tomato, if placed in an environment similar to that of fruits normally attacked.

O. C. McBride and A. C. Mason, Honolulu, have made a study of the effect upon the mango weevil (Sternochetus mangiferae Fab.) of subjecting mangoes to low temperatures. A considerable quantity of late maturing fruit was subjected to temperatures ranging from 15° to 20° F., one tray, containing approximately 100 fruits, being removed at the end of each 24-hour period. Incidentally, the fruit was frozen solid and on thawing the flesh was injured. The actual infestation of fruit ranged from 66 per cent to 88 per cent, and involved a total of 1,721 weevils. Mr. McBride and Mr. Mason report: "Larvae of the mango weevil are less resistant to 20° F. than either the adults or pupae. Five days are sufficient to kill all the larvae. It requires 7 days' exposure to give 100 per cent kill of the pupae. * * * These data show that a period of more than 15 days is required to give 100 per cent kill of the adults." It was impossible to secure fruits to continue the study until all the adults were dead.

The outstanding achievement in nutritional studies in connection with the Mediterranean fruit fly conducted by C. E. Keck, of Honolulu, was the rearing of one individual on heated yeast and distilled water. Mr. Keck says: "This individual was from a group of ten newly hatched larvae which were fed on this material alone during the larval stage. The adult was a female and appeared to be a normal individual."

The vapor-sterilization studies on avocados continued during September, by O. C. McBride at the Honolulu laboratory, confirm the previous findings that the treatment of avocados with high temperatures does not give satisfactory results. Mr. McBride states, however, that "pineapple plants heated for one-half hour after the inside temperature of the plants reaches 50° C. give 100 per cent kill of the pineapple mealybug (Pseudococcus brevipes Ckll.)"

TRUCK CROP INSECTS

"The tachinid Phorocera claripennis Macq. appeared early in the season as a parasite of larvae of the Mexican bean beetle (Epilachna corrupta Muls.)," according to B. J. Landis, of Columbus, Ohio. "Approximately 2 per cent parasitism occurred during August and September among field-collected larvae. The life cycle of this tachinid is slightly longer than that of Paradexodes epilachnae Ald. Bean-beetle larvae parasitized by these two tachinids have different appearances. A larva hatching from the white egg of P. claripennis leaves a black sunken scar in the host exoskeleton after it has entered. A day previous to emergence, the mature maggot of P. claripennis appears surrounded by a dull, muddy fluid. On emerging, the maggot eats a large, ragged hole in the interior ventral part of the host wall. The posterior end of the maggot does not taper, but ends abruptly and the two anal spiracles are separated. The puparium is generally lighter in color than that of P. epilachnae and is narrower toward the posterior end. A larva hatching from the transparent egg of P. epilachnae enters and a conical mass of dried yellow or-

cretion from the host larvae closes the wound. A day before the emergence of the mature maggot the host larva is colored a glassy, transparent brown. The emergence hole is a narrow slit in the dorsal wall at the posterior edge of the second thoracic segment."

Experiments conducted by J. C. Elmore, Alhambra, Calif., to determine the most satisfactory insecticide for the control of the pepper weevil (Anthonomus eugenii Cano) have given the following results: "A commercial barium fluosilicate (80 per cent) * * * burned the leaves and buds, stunted the plants, and caused them to turn yellow. The pods were smaller and fewer than in check plots. When this material was diluted 50-50 with talcum there was the same type of injury, though less marked. One grower used barium fluosilicate on bell peppers, and six applications caused severe injury and stunting, although satisfactory pepper weevil control was obtained." Undiluted synthetic cryolite applied under the same conditions resulted in slight injury of the same general type, but without the clear-cut stunting and yellowing. "Definite injury by cryolite has been noticed in laboratory plots. * * * Calcium arsenate has not shown a tendency to burn plants except where it has drifted onto plants already dusted with barium fluosilicate. These two materials together almost kill the plants. Undiluted potassium aluminosilicate was also used in field plots. Weevil control seemed very good and there was no greater injury than occurred in cryolite plots."

W. C. Cook, Davis, Calif., writes that as a result of two trips over the San Joaquin Valley in search of summer breeding grounds of the beet leafhopper, "information has been accumulated showing that in all places in the foothills where large concentrations occurred this past spring there are summer breeding grounds within a very short distance. In every case these summer breeding grounds are larger this year than they were last year, owing mainly to a couple of late rains this spring which helped the weed vegetation. It seems quite possible that these summer breeding grounds on the west side are key areas which furnished a great majority of the overwintering leafhoppers."

An effective barrier against mole crickets (Scapteriscus acletus R. H.) has been devised at Sanford, Fla., according to C. F. Stahl. "During August a barrier of celery paper was placed around a 3-acre plot on the Rex Packard farm. * * * The paper was 12 and 10 inches wide and was placed in the ground to a depth of from 4 to 6 inches. The plot was then baited and the infestation almost eliminated. The heaviest infestation was on the east side of the barrier. It was soon evident that the barrier was effective, as indicated by the amount of burrowing on the outer side. The crickets would work up to the paper, where they were stopped. The paper did not, however, stand up well in the soil. After a period of two weeks the portion in the soil was rotting badly. It was apparent, nevertheless, that a barrier no more than 6 inches in the ground is effective in stopping the crickets under the conditions in which it was tried."

S. E. Crumb, Puyallup, Wash., reporting on results obtained in baiting city blocks for the European earwig, says: "It will be noted

that, except for slight recessions on the fourth and sixth weeks, the percentage of mortality steadily rises for at least nine weeks after the bait is applied. This is probably due chiefly to the fact that the living earwigs eat the poisoned dead. The six blocks which were kept under observation for a period of nine weeks had an earwig population of 41,696 at the beginning of the experiments and a population of 1,168 at the end of 9 weeks. These results seem to indicate that a city block forms a rather isolated unit which is not heavily invaded by earwigs from surrounding infested areas."

Mr. Crumb also reports that the Puyallup laboratory "prepared an exhibit and had charge of a booth dealing with the earwig at the Western Washington Fair. A member of the laboratory staff was constantly in attendance at this booth during the 7 days the fair ran. The number of persons who actually examined the exhibit was 6,138."

During the first part of September K. B. McKinney, of the Tempe, Ariz., laboratory, spent a few days in a general survey of the higher altitudes in the vicinity of Payson, Ariz., to determine at what altitudes the tobacco stalk borer might be found. He says: "The borers were found infesting Datura sp. at an elevation of a little above 6,000 feet. These plants were not heavily infested but both larvae and adults were found. A light infestation was also found in a few experimental tobacco plants at about 5,000 feet elevation."

N. F. Howard, Columbus, Ohio, reports the liberation, in the States of Alabama, Georgia, Kentucky, New Jersey, New Mexico, Ohio, and Virginia, during the months of August and September, of 10,531 Paradexodes epilachnae Ald., the tachinid parasite of the Mexican bean beetle. These liberations consisted of colonies varying from 125 to 1,300 flies. In view of the great difficulties which have been experienced in the efforts to introduce and establish this parasite, it is of interest that "Recoveries of P. epilachnae have been made at Columbus, Ohio, in numbers during the past month. On September 30, parasitized larvae were recovered from two locations more than a mile from the place of liberation. These locations were to the west of the place of liberation and in the direction of the prevailing winds."

In connection with his local studies of the beet leaf hopper, H. E. Wallace, Riverside, Calif., reports a marked variability in the virulence of the curly-top disease of sugar beets as transmitted by the leaf hoppers coming in from their natural breeding areas. The interesting point is the close relationship in such variation with human and other animal diseases. It is possible to rear, under controls, leaf hoppers free from this disease, and experimental work is reported indicating that such nonviruliferous stock, if impregnated by being placed on plants with a mild type of disease, conveys such mild type, and if placed on plants with a virulent type, that type is transmitted. These experiments have been conducted in close cooperation with phytopathologists of the Bureau of Plant Industry. A practical application of this information is not in sight. Clearly the type of disease carried by the migrating leaf hoppers is governed by chance, and control of these leaf hoppers in natural breeding grounds is still problematical.

E. W. Jones, engaged in wireworm investigations in Walla Walla, Wash., reports a plan to undertake a continuing series of quantitative studies of wireworms, "to determine such points as (1) the brood number, (2) normal seasonal mortality, (3) food preferences, and (4) the effects of edaphic and climatic factors on the numbers of each brood of wireworms. * * * The method of sampling consisted of taking a set of 25 one-quarter square foot samples 12 inches deep in each field. Each sample was taken by driving a 6 by 6 inch by 1 ft. steel form into the ground and removing the soil within the forms. Each sample was then washed in 40-mesh screen pans. The wireworms thus secured were counted and records made of the number of each brood obtained in a sample." Mr. Jones presents the following table giving the results of this type of investigation for the season 1931:

Precentage of total wireworms of the 1931 brood in various crops

Crop	Number 1/4 sq. ft samples	Total number wireworms	Number wireworms per sq. ft.	Percentages 1931 brood.
	Pheletes canus Lec.			
1. Onion	60	164	11	58
2. Carrot	25	213	34	75
3. Potato	100	275	11	64
4. Spinach	20	127	25	81
5. Corn	50	167	13	65
6. Rhubarb	41	186	19.6	65
7. Sweetclover	6	99	68	42
	Pheletes californicus Mann.			
8. Alfalfa	50	152	12.3	55
9. Oats	25	155	25	64
			Total average	63 per cent

Sixty-three per cent of the total number of wireworms in the soil samples were found to be of the 1931 brood.

FOREST INSECTS

A. L. Gibson, who is in charge of the annual insect survey of the Beaverhead National Forest, Mont., reports that preliminary results show a tremendous increase in the 1931 infestation by the mountain pine beetle (Dendroctonus monticolae Hopk.), and states: "On the northern and western portions of the forests, where the units have been completed, there is an increase of some 5,500,000 trees over the number attacked in 1930. Experiments conducted in connection with this survey show very clearly that the attacking beetles emerge some few weeks after attack and reattack

other trees. Data have also been secured showing that the attack of these insects extended through the month of August into September."

According to F. P. Keen, of Portland, Oreg., "The defoliation of hemlock in southwestern Washington by the hemlock looper * * *declined rapidly during the first half of September, as more and more caterpillars entered the pupal stage. * * * Parasites are fairly abundant. Nearly 30 per cent of the pupae are parasitized by ichneumons and another 20 per cent by a tachinid. These parasites have started emerging in the laboratory, but probably overwinter in the pupal stage under normal conditions in the field. Whether parasites will stop this epidemic this year is still uncertain. An observation flight was made over the area on the 19th to check on the extension of the defoliated areas. * * * It was evident that considerable extension of the defoliated areas had occurred, but the effect of the dusting was also noticeable, particularly where areas had been thoroughly covered and dust clouds placed in parallel strips."

Mr. Keen also reports as follows concerning the fall survey of the lodgepole forests in Crater Lake National Park to determine the effect of the control work against the mountain pine beetle: "The treated areas show the reductions which have been secured usually from such work. Most of the reductions will amount to 75 per cent. Less favorable results were secured in two units where the dense stand rendered the sun-curing method of control less effective. Probably the burning method will have to be used in such areas in the future. Only a few heavily infested areas are now present on the outskirts of the controlled areas and for the most part the recent epidemic of the mountain pine beetle is now under control."

"Infested white pine areas of Ranier National Park were examined during the month by J. A. Beal, of Portland, Oreg., to check on the results of the control work carried on last spring against the mountain pine beetle," according to Mr. Keen. "He (Mr. Beal) reports that an exceptionally fine cleanup has been secured and only a few newly infested trees in areas considerably distant from the controlled areas have been found. These will be treated this fall by the Park Service. The good results secured on the Rainier areas are due to the thoroughness with which the infested trees were disposed of, the isolation of the treated areas from any outside sources of reinfestation, and the concentrated grouping of the infestation which made it possible to spot all infested trees without missing any scattered individual ones."

Having continued his experiment in cross-breeding Tachina larvarum L. with T. mella Wlk., in connection with his studies of parasites of the gipsy moth (Porthetria dispar L.), R. T. Webber, Melrose Highlands, Mass., reports: "Additional information* * * indicates that, while fertilization is effected, the progeny are considerably weakened by the crossing. With pure stock the percentage of hatching is very high. It is directly the reverse in the case of the cross, the larva apparently having great difficulty in freeing itself from the egg."

A report from the gipsy moth laboratory, Melrose Highlands, Mass., states: "In connection with importations and liberations of parasites of the European pine shoot moth (Ryacionia buoliana Schiff.) made during

1931, a letter and returned specimens received from C. F. W. Muesebeck by C. W. Collins, of the gipsy moth laboratory, Melrose Highlands, Mass., are of interest. Mr. Muesebeck took specimens of certain species to Washington for study. Two species, which in former reports of the laboratory were referred to by generic names only, have now been specifically determined. One, determined by Mr. Muesebeck, is Orgilus obscurator (Nees). The other was identified by Mr. Cushman as Cremastus interruptor Grav. Mr. Muesebeck states, in connection with Orgilus obscurator, that a single specimen, reared from the European pine shoot moth taken at Newport, R. I., several years ago is, in his opinion, the same species, indicating that this parasite is already established in this country."

J. A. Millar, Melrose, Highlands, Mass., submits the results of his collections and parasite rearings of the gipsy moth larvae and pupae. These collections of 100 each are made from designated areas in the New England States and totaled 7,079 larvae and 1,954 pupae. He summarized the results for the larvae in the following table, comparing 1930 with 1931.

	Comparative parasitism Per cent	
	1930	1931
Apanteles melanoscelus	6.1	3.56
Hyposter disparis	0.3	0.27
Compsilura concinnata	6.0	6.27
Sturmia scutellata	4.0	1.20
Total	16.4	11.30

A similar comparison of pupae is indicated as follows:

	1930	1931
	Per cent	
Sturmia scutellata	24.87	18.16

CEREAL AND FORAGE INSECTS

C. H. Batchelder and D. D. Questel, of the European corn borer laboratory, Arlington, Mass., report as follows: "During the period of August flight, August 8 to September 4, 3,126 corn borer moths were caught in bait traps on the Berkley farm. Ninety-five experimental preparations were employed as baits, the most effective being a 15 per cent solution of medium-grade molasses fermented with yeast. The maximum catch on one night in one trap was 24 and the total catch in 75 traps in one night was 251. During the period August 18 to 24 a total of 988 moths were taken, of which 60.7 per cent were females. More than 80 per cent of the females were newly emerged and had not deposited eggs. Various preparations of molasses, malt, cane sugar, fruits, and corn were employed in this series of fermented products, as well as many biochemical materials. Moths were caught when traps were set up on marshes and on islands in the river where the nearest cornfield was at least a mile distant."

R. E. Kimport, of the Bayshore, L. I., corn borer sublaboratory, reports: "A number of plants were examined for infestation by the corn borer in the two-generation area of Long Island, and the following hosts were found: Corn, potato, lima bean, string bean, rhubarb, spinach, muskmelon, pumpkin, cucumber, tomato, dahlia, gladiolus, Sudan grass, barnyard grass, foxtail grass, eggplant, lamb's quarters, smartweed, ragweed, pigweed, and dock. During this period * * * a survey was conducted in lima beans on the eastern half of Long Island, This survey covered 97 fields, totaling 145.77 acres, and from samples of 61 fields infestation was shown. At the time of the survey a great percentage of the pods had been harvested; therefore, the percentage of plant infestation with no pod infestation was very large."

According to the report of L. H. Patch, Sandusky, Ohio, "One strain of corn is designated as resistant to the corn borer, compared to another strain, if the percentage of eggs hatching and developing into mature borers on the first strain is less than the percentage of eggs producing mature borers on the second strain. During 1930, 2 strains of corn were found to be distinctly resistant to the borer, and Dr. J. R. Holbert's imbred strain R4 was father to the one and mother to the other. This year the original 2 strains and 2 more strains, with R4 as a parent, were tested with 20 other strains received from Doctor Holbert and others. It is encouraging to note that the 4 strains with inbred R4 as a parent were the lowest in borer survival this year also. The percentage survival of these 4 strains averaged 10.2. The percentage survival of the 24 strains arranged in groups of 4 strains averaged as follows: 10.2, 13.1, 15.9, 17.8, 20.4, and 22.0. Thus it is seen that the resistance to the borer this year of the 4 strains with inbred R4 as a parent was 2.16 times greater than that of the 4 strains least resistant to the borer and 2.08 times greater than that of the 8 strains least resistant. Of the 29 strains tested in 1930 the resistance of the 2 strains with imbred R4 as a parent was 2.15 times greater than that of the 10 strains least resistant."

A statement by Morris Schlosberg, of the Toledo, Ohio, corn borer experimental farm, says: "The number of mature corn borer larvae in corn plants resulting from the number of eggs laid on the particular corn variety, expressed as a percentage figure, is termed the rate of larval survival for that variety. Studies embracing the cornfields on the Toledo farm reveal that approximately 17 per cent of the eggs laid on the farm resulted in mature larvae. This figure contrasts sharply with the 4.6 per cent rate of larval survival obtaining in Lucas County, as determined by comprehensive surveys cooperatively conducted by the Bureau of Entomology and Plant Quarantine and Control Administration, indicating, perhaps, the generally better corn conditions on the farm. A comparison of the seasons 1928, 1929, 1930, and 1931 shows, respectively, the following rates of larval survival: 34.6, 19.3, 4.6, and 17.1. The survival rate of each season reflects the prevailing climatic conditions and the influence of these upon the corn plants and borer."

C. A. Clark, of the Kobe, Japan, sublaboratory, reporting on work with parasites of the European corn borer, states: "Laboratory-reared

Cremastus hymeniae Vier. have been found to have a life cycle of about 26 days at Kobe, Japan, in July and August. About nine days are spent in the cocoon stage. Adults do not usually attack free-crawling larvae, but hunt actively for young larvae which have made shallow holes in the host plant. Corn-borer larvae 6 to 10 days old (second-instar) are successfully parasitized by this species. The adults can be kept alive in the laboratory for a considerable length of time. Some adults kept at the Kobe laboratory had an average length of life of 64 2/3 days. These were given plenty of fresh water daily on pieces of cotton and also some in the form of a fine mist. Lump sugar was also provided. The temperature in the laboratory was usually over 80° F. and often above 90° F."

Of introduced parasites of the European corn borer, summer collections made in the Eastern area by R. A. Biron, Arlington, Mass., "show Inareolata punctoria Rom. doing the best work, with Masicera senilis Meig. nearly as effective. Both together make up over three-quarters of the parasites appearing in collections from 27 representative towns. Six of these towns run over 30 per cent parasitism, exclusive of the egg parasite. Tabulations are too bulky to offer but the dispersion records and rise of parasitism from these 27 towns are gratifying. * * * Studies under cover of the parasite abundance per acre indicated a variation from approximately 5,000 per acre to 10,000." It is pointed out, however, that "a careful check-up of parasite cocoons and puparia indicated nearly twice as many parasites per acre as the figures offered in this report."

According to H. H. Walkden, of the Wichita, Kans., laboratory, "The bait-trap record of emergence and flight of moths of cutworms and related species injurious to cereal and forage crops showed the occurrence of a heavy flight of Heliothis obsoleta Fab. beginning September 25. * * * The flight of adults of the corn earworm was so great that hordes of them settled down in the business district of the city, attracting general attention and causing considerable annoyance."

G. W. Barber, of the Savannah, Ga., sublaboratory, states that "the total deficiency in rainfall for the year in the location of our station is about 20 inches, with the result that the soil during this month has been completely dry for the first few inches and is almost dry to a depth of at least 4 or 5 feet, much below the line where water is usually found by digging. This has appeared to have certain important effects on the soil habits of the ear worm. Larvae of the corn ear worm which entered the soil during the period August 20 to 25 dug much deeper as a rule than I have ever observed heretofore under any conditions. Some of them dug so deeply that the pupae were found up to 10.4 inches below the surface, while depths of 6, 7, 8, and 9 inches were common. Most of these pupae hibernated, as a result of these unusual depths."

"Apanteles diatraeae Mues., the larval parasite of the southwestern corn borer (Diatraea grandiosella Dyar), has been very active and effective during September," according to E. G. Davis, of Tucson, Ariz. "Adults have been numerous in green corn plantings and by the end of the month they had parasitized over 80 per cent of the third-generation corn-borer larvae. This parasite was still active at the end of the month, although there were few corn-borer larvae exposed enough to be attacked."

In connection with work on the sugarcane borer (Diatraea saccharalis Fab.), by T. E. Holloway and W. E. Haley at New Orleans, La., Mr. Holloway says: "The final totals for 1931 on foreign parasite introduction can now be given. Of the fly Paratheresia claripalpis Wulp, 444,017 puparia were received from H. A. Jaynes, located At Trujillo, Peru; 5,000 puparia were given to the European corn borer laboratory. Of the remaining 439,017, we obtained 65,842 adults, or an emergence of practically 15 per cent. Flies were released at twelve Louisiana sugar plantations, from less than 1,000 to more than 12,000 being released at each place. * * * Of the wasp Ipobracon rimac Wolcott, 38,063 adults were received. Of these, 13,458 reached us alive, giving a survival of 35.3 per cent; 13,227 wasps were released on two Louisiana sugar plantations."

Mr. Holloway states that: "A feature of the year's work was the perfecting of a shipping cage for Ipobracon which gave a maximum survival of over 90 per cent for the six-day trip by airplane and train from Trujillo, Peru, to New Orleans. * * * As described in our report for July the successful shipping cage was a crate 5-3/8 inches by 8-3/4 inches by 10-3/4 inches. The ends, top, and bottom were of solid wood, while four slats were nailed on each side. Each side was covered on the inside with wire screen and black cloth. The wasps were provided with sugar and a specially devised container for water. One thousand wasps were sent in such a cage."

H. L. Parker, of Hyères, Var, France, reports the successful termination of the season's earwig work as follows: "A total of 140,000 earwigs have been collected from the various European regions as follows: Bergamo, Italy, 110,000; England, 20,000; Nice, France, 5,000; northern France (Paris), 3,000. The greater part of these have already been sent to Arlington in small boxes via parcel post, where they will be inspected and forwarded to Mr. Crumb, Puyallup, Wash. The earwigs (about 200 per sack) were placed in small canvas sacks and the open end sewed down. These sacks were placed in small wooden boxes, (two per box). Food consisting of cream of wheat, bananas, and crushed Pyrausta larvae, pressed into a small cake, was added to each sack to supply nourishment en route."

H. K. Painter, of the Lafayette, Ind., laboratory, reports that "determination of parasites reared from Phytonomus nigrirostris Fab. (the lesser clover-leaf weevil) collected last spring at Roanoke, Ind., showed them to be Microbracon tachypteri Mues. This species was received from Utah in 1926 and liberated near Lafayette, but it may have been present here before that time."

J. R. Horton and H. H. Walkden, of the Wichita, Kans., laboratory, present an interesting report on the effect of soil moisture on the Hessian fly and its parasites, covering the post-harvest period July to September, inclusive. The summary covers data secured from two strips, both receiving the natural precipitation of 9.3 inches--"of such poor distribution that it constituted in effect a period of drought in which the soil was dry, hard, and hot." One of the strips, however, was given irrigation and "during this period * * * received 6 applications of water averaging 5.05 inches each, so distributed as to prevent the soil from becoming thoroughly dry for any prolonged period and maintaining soil temperatures several degrees lower (than the other) throughout the 90 days. During that time periodical examinations were made of the puparia--nearly 800 from each strip--and the

condition of the fly forms was noted. The record shows that on an average about 76 per cent of the larvae were parasitized, 8 per cent destroyed by desiccation, and 10 per cent remained viable and in healthy condition in the irrigated strip; whereas in the arid strip about 51 per cent were parasitized, 23 per cent destroyed by desiccation, and 21 per cent remained viable and in healthy condition. In this connection it should be considered that 51 per cent average parasitism is about as high as the average has been in any one of the past 4 years on that land, and is much higher than in most years."

COTTON INSECTS

Airplane collections of insects made during September at Tullulah, La., by P. A. Glick and J. M. Yeates were as follows: "There was a total of 1,006 insects collected at the following altitudes (with the numbers of insects taken given in parenthesis): 200 feet (287), 500 feet (240), 1,000 feet (211), 2,000 feet (115), 3,000 feet (96), and 5,000 feet (57). * * * The total collection of insects for the month of September, 1931, showed an average of 4.12 insects taken in a period of ten minutes as compared with 2.83 insects taken in the previous month."

Life-history studies of the tarnished plant bug (Lygus pratensis L.) and the cotton plant bug (Adelphocoris rapidus Say) by K. P.Ewing, W. S. Cook, and R. L. McGarr at Tullulah, La., furnished the following information: "Lygus pratensis-- Egg-incubation records were secured on 1,136 eggs during September. The average incubation period was 8.04 days, the maximum being 13 and the minimum 7. The host plants of these eggs were Erigeron canadensis and goldenrod. One nymph was reared to maturity, the number of days in the nymphal stage being 17. Adelphocoris rapidus-- Nine egg-incubation records were secured during the month. The average incubation period was 10.7 days, the maximum being 14 and the minimum 10. Ten attempts were made to rear nymphs to maturity. Four individuals were successfully reared, with an average of 16 days in the nymphal stage. Cotton was used as the food plant of six nymphs and Chamaecrista robusta as the food plant of four."

Population counts of the three important cotton mirids on 14 host plants in addition to cotton were made by Mr. Ewing and his assistants during September, by making a total of 12,600 sweeps with a hand net. "The average number of Psallus seriatus Reut. collected per 100 sweeps from croton during the first, second, third, and fourth weeks was 1,604.3; Adelphocoris rapidus collected per 100 sweeps from Chamaecrista robusta during the first, second, third, and fourth weeks was 146.3, 183.5, 268,3, and 117.4, respectively. The average number of Lygus pratensis L. collected per 100 sweeps from Erigeron canadensis during the first, second, third, and fourth weeks was 308.4, 177.5, 579.0, and 387.5, respectively. With the exception of the collection of Lygus pratensis during the second week, these sweepings show that these insects increased in number on their respective preferred host plants during each successive week until the fourth week

was reached, when there was a considerable diminution in population. From 200 to 500 sweeps were made on each plant during each week of the month. The greatest number of insects per 100 sweeps was collected on September 17, when 4,537 adult and 1,572 nymph Psallus seriatus were collected from croton, 186 adult and 277 nymph Adelphocoris rapidus were collected from Chamaecrista robusta, and 409 adults and 431 nymph Lygus pratensis were collected from Erigeron canadensis. Sweepings on cotton showed there were more Adelphocoris rapidus in the cotton than any other mirid; however, this insect was not present in large enough numbers to do any material damage. The scarcity of mirids in cotton during September was probably due to the maturity of the plant."

Oviposition records on the pink bollworm taken in the insectary at Presidio, Tex., by W. L. Owen, jr., and assistants indicate that "with females from square material there is a gradual decrease in vitality and productive powers with each succeeding generation, while with females from boll material vitality and productive powers seem to increase with each generation. This may, in a measure, account for the jump in infestation the latter part of the season each year."

Four experiments have been completed in the poison-plat tests conducted by F. F. Bondy at Florence, S. C., in connection with research aimed at the control of the cotton boll weevil. In the first of these experiments an untreated plat produced 1,063 pounds of seed cotton per acre; a plat receiving three early applications of molasses mixture, followed by three later applications of calcium arsenate dust, produced 1,435 pounds per acre; while a plat receiving three early applications of molasses mixture, followed by five later applications of calcium arsenate dust, produced 1,505 pounds per acre. In the second experiment an untreated plat produced 1,155 pounds of seed cotton per acre, while a plat receiving sodium fluosilicate produced 1,140 pounds per acre. In the third experiment an untreated plat yielded 1,255 pounds per acre, while a plat receiving only three early applications of 1-1-1 molasses mixture produced 1,323 pounds per acre. The fourth experiment gave a yield of 947 pounds per acre on a plat receiving no treatment and a yield of 1,150 pounds per acre on a plat receiving calcium arsenate dust after 10 per cent infestation, the treatments being continued throughout the season.

E. W. Dunnam, College Station, Tex., reports as follows on the population and migration of cotton bollworm moths:" Information obtained by the use of the two-row wheel trap indicated that the peak of population was reached by August 20. The population decreased to practically nothing on September 1. Incidentally there were practically no eggs being deposited when the peak of population was reached. The proportion of males to that of females was about equal. There were no bollworm moths taken from standard upright screens."

The cotton perforator infestation dropped rapidly during the month, according to T. C. Barber, of the Calexico, Calif., sublaboratory. "This was due to the effect of cooler temperatures as well as to the greater effectiveness of controlling agencies. * * * The average infestation during September was about one-seventh of the average infestatio for August."

The territory in which the cotton perforator is known to occur has increased very greatly, as indicated by a survey of its distribution conducted by Mr. Barber and T. P. Cassidy. "While the most recent field reports have not yet been analyzed and checked, the perforator has been found to occur in Texas as far north as Graham, in Young County, or about 700 miles north of Brownsville. The territory known to be infested in Texas, therefore, includes the major portion of the great cotton sections. In California isolated infestations have been found at Riverside and Escondido, at distances of 70 to 80 miles from the previous most northern and western points of infestation A survey of the cotton sections of the San Joaquin Valley of California, however, failed to show the presence of any cotton perforator infestation in that territory. Since every known cotton area in Arizona and New Mexico has been found to be infested, the total infested territory is assuming very formidable proportions and the potential possibilities of the species as a cotton pest are increasing with each new infestation discovered." Mr. Barber reports also of securing in September additional proof of perforator migration, through the agency of small trap plantings of cotton located 40-45 miles from the nearest cotton fields, all of which plantings became infested. In regard to its habit, he adds: "While the cotton perforator is essentially a leaf attacking species, it can also obtain sustenance from the calyces of the squares as well as from the walls of the cotton bolls. During the past two months examinations have been made of 800 cotton squares, of which 534, or 66.7 per cent, showed the presence of the perforator mines. During the same period 885 bolls were carefully examined, of which 81 bolls, or 9 per cent, were found to exhibit perforator mines. Of these 81 bolls 49 showed mines in the outer wall, while the remaining 32 bolls showed the mines on the inner wall."

INSECTS AFFECTING MAN AND ANIMALS

In studies on the relation of ticks to relapsing fever, W. G. Bruce has noted that in Texas "young buzzards are hosts to these ticks and also serve as a means of transportation for the ticks from one locality to another."

Refined mineral-oil soap and dipyridyl oil as materials for the control of goat lice were investigated by O. G. Babcock at Sonora, Tex. With regard to the tests with refined mineral oil soap, Mr. Babcock writes: "On July 29 the animals were dipped in this oil at concentrations of 1 to 15, 1 to 30, and 1 to 45. The two weaker dilutions did not kill well but the stronger (1 to 15) apparently did a good job. However, when all these animals were sheared on September 25 one of the animals that was dipped in the oil at a dilution of 1 to 15 had four or five live and active lice upon it. The other animals were clean. This goes to show that 1 to 15 is the optimum strength and that it will require a still stronger dilution of 1 to 10 or 1 to 12 to be sure of a complete kill. Unfortunately this refined oil appears to stain the mohair. Scouring tests to be made soon will determine this point." In describing the test with dipyridyl oil, he says: "The animal that was dipped in this oil on July 29 was sheared on September 25.

Not a louse could be found, new mohair was in excellent condition, but the old mohair retained a rather bad yellow stain. This substance is very toxic to insect life even at a strength of 0.5 per cent and needs further study."

D. C. Parman, Uvalde, Tex., reports as follows regarding his investigations of blowfly parasites and predators: "The emergence from the status jars made in western Texas July 14 to 29 has practically been completed. In this area 252 jars were exposed, one was broken, 251 were returned; 27,920 flies emerged from 227 jars; 220 predacious beetles were recorded from 39 jars (32 sylphids from 9 jars, 158 Histeridae from 29 jars, and 30 Staphylinidae from 11 jars). The predators were quite well distributed over the area but were most numerous on the escarpments; no new species were found so far as has been determined. Only two species of parasites were bred from the jars; 158 Brachymeria fonscolombei Duf. emerged from 17 jars; these were from the area Leaky to Ozona, and one jar at Comstock; 3,675 Mormoniella vitripennis Walker were bred from 78 jars; these were mostly from the area Leaky to Sonora, but this parasite was indicated to be generally distributed."

"Emergence from the jars exposed in Texas, New Mexico, and Arizona from August 19 to September 5 has not been completed. A large larval parasite, Alysia ridibunda Say, has been bred from this series in quite good numbers from Arizona and New Mexico, over 200 from one jar, and it has promise of being a valuable parasite. Xyalosema is beginning to emerge from several jars. B. fonscolombei has emerged (506) from 18 of these jars and a new record of distribution has been obtained, as it has been found west of the continental divide at Safford, Ariz. Only a few jars have yielded M. vitripennis; this may be accounted for by the short exposure period of eight days. In this series 43 jars were exposed and 377 were recovered; large numbers of flies have emerged from the jars in the eastern part of the area, but the emergence has been rather light in the western part of the area covered. Predators were recorded from most of the jars in the west section, and 6,189 histerids and sylphids were recorded from 223 jars; one new and apparently valuable sylphid was recorded from Arizona.

"Considerable breeding work has been done at Uvalde with Alysia ridibunda from Arizona. Sixteen host tests have been made on the larvae of the following flies: Cochliomyia macellaria Fab., Lucilia (two species), Sarcophaga plinthopyga Wied., Ophyra leucostoma Wied., and Synthesiomyia nudiseta V. d. Wulp. The parasites were very ready to attack the larvae of any of the above species, seeming to work readily with either small or mature larvae. * * * The developmental period of Xyalosema is indicated to be about 31 days, by tests to date."

Reporting on abundance and longevity of the mosquito at the Portland, Oreg., laboratory, H. H. Stage says: "The last larvae of Aedes vexans Meig. emerged from breeding jars on June 22, at Wahkeena Falls. Since that time, at regular intervals, ten-minute collections have been made for the purpose of getting information on longevity and biting habits. Late in June, when they were recently emerged from the pupal stage, from 25 to 40 adults could be collected on one's person in a ten-minute collection. On the 17th of September 22 adults were taken, and on September 30, after a few days of lower temperatures, only 4 were taken in such a collection. These

adults were at least 100 days old. It is interesting to note that this species still persists in the vicinity of Wahkeena Falls. This is only one of several locations where the species has been breeding in large numbers, but it seems to be the only location where A. vexans can be found so late in the season. This may be explained by the nature of the geological formation about Wahkeena Falls. Breeding takes place along a narrow willow flat which is bounded on one side by the Columbia River and on the other by high cliffs, which together probably serve as effective natural barriers against dispersion. Our records of 1930 show that female A. vexans were taken at least 112 days after emergence."

An investigation of the mosquitoes of Klamath County, Oreg., carried on during the summer by M. F. Canova, of Portland, Oreg., has been completed. Mr. Canova's report says in part: "Seven species of mosquitoes were found inhabiting Klamath County, Oreg.: * * * Aedes dorsalis Meig., Aedes melanimon Dyar, Aedes fitchii F & Y., Culex tarsalis Coq., Anopheles maculipennis Meig., Culicella inornata Will., and Culicella incidens Thom. The members of the genus Aedes were found to be the most numerous * * * Aedes dorsalis was the predominant species during the latter part of spring and the first part of the summer. Aedes melanimon was the predominant species during the latter part of summer. Next in order of abundance throughout the mosquito-breeding season came Culex tarsalis, Culicella inornata, and Anopheles maculipennis. Culicella incidens were numerous in various isolated places toward the latter part of August and more anophelines were found on the wing then than earlier in the year. *** Of major economic importance throughout the season were * * * A. dorsalis and A. melanimon. Aedes dorsalis was the predominant species during the first half of the mosquito season, and Aedes melanimon * * * during the last half of the season. These two mosquitoes pass through their larval, or "wiggler," stage in the temporary water of the flooded fields of the Klamath region. They develop very rapidly in the rich, warm, hay-infusioned water, in the direct rays of the intense summer sun. Larvae have been known to pupate and emerge as adult mosquitoes in as short a time as seven days after their eggs had hatched."

STORED PRODUCT INSECTS

Perez Simmons, Fresno, Calif., reports: "Tests of the effectiveness of ethylene oxide under covers of water-proofed canvas were made September 5 and 8 in a fig storage warehouse. * * * The figs were piled in bulk within walls of open boxes of figs. The piles measured about 25 by 15 by 5 feet high, and were covered crosswise with three 20 by 30 foot pieces of canvas, one at either end and one in the center, overlapping the end pieces. A fourth canvass was spread over the whole, lengthwise. The dosage rate was 3 pounds of the fumigant to 1,000 cubic feet. Two large pans were placed on each pile to receive the fumigant. Provision for weighing down the edges of the canvas covering was not made, owing to lack of sufficient space between the piles of fruit. In the first test the ethylene oxide was allowed to run from a previously cooled cylinder into a bucket con-

taining solid carbon dioxide as a cooling agent to prevent excessive evapo ration while the liquid was being discharged and weighed. The method was slow and unsatisfactory because of loss of some fumigant from the pans before they could be covered with canvas. In the second test the pans were covered with canvas and the ethylene oxide introduced from a previously warmed cylinder through a long tube. All the test insects (Ephestia larvae and saw-toothed grain beetle adults, buried in the figs at the top and bottom and at one-foot intervals between) were killed in the second fumigation, whereas the mortality following the first test was incomplete. * * * One grower is fumigating stacked drying trays of figs under canvas, using hydrocyanic acid gas generated by the pot method."

The tentative conclusion of J. R. Arnold, field assistant at the Fresno laboratory, that the species of moths now most common in vineyards is Ephestia figuliella Greg. has been confirmed by an identification received from Carl Heinrich, of the Taxonomic Unit of the Bureau of Entomology through H. Kieffer and D. B. Mackie, of the California State Department of Agriculture. Mr. Mackie writes also that the species has hitherto been unknown in the West and never previously has been recorded as a pest of fresh fruit."

A study of the natural mortality of the pea weevil due to the direct sunshine in the field after harvest has been made by A. O. Larsen, Corvallis, Oreg. He says: "It appears that the mortality of the weevils in unshelled pea pods or in other protected places is much lower than in unprotected peas lying on the ground." For such unprotected peas, he records a mortality of 73 per cent, as against a mortality of 29 per cent where similar ground had received a protection from straw spread over part of the field, and 30 per cent from pods picked from scattered vines about the field.

Newell E. Good, Sligo, Md., reports: "Numerous tests have been carried on to determine the ability of various species of insects to penetrate the different types of flour bags now in use. These seem to show that the finely-woven cambric bags are very good protection against most insects but are of little value against such beetles as the cadelle and the black carpet beetle, which are able to chew through the bag and the larvae are also able to force their way through. The coarser bags, such as jute or osnaberg, are of very little value in excluding any insects."

At Richmond, Va., E. M. Livingstone has completed egg-laying records on the tobacco moth (Ephestia elutella Hbn.) and other data on 55 pairs of moths. These records show: "The largest number of eggs laid by one female is 279. Egg-to-adult rearings have been completed in the laboratory as follows: On tobacco, 127; on yeast cake, 315; on cornmeal, 50. The average rate of development on these foods is as follows: On tobacco, 54 days; on yeast cake, 46 days; on cornmeal, 43 days. The first moth of the second generation in the laboratory emerged September 28. Our observations to date indicate that Ephestia elutella completed two generations in 1931 in tobacco warehouses in Richmond."

BEE CULTURE

Pollen-gathering studies made during the summer at Laramie, Wyo., by Russell Smith have been completed for this season. Mr. Smith's records show that out of a "total of 31,175 samples of pollen taken during the season * * * 22,424 samples were brought in by the bees from sweet clover; 6,589 were from other legumes. Six types of pollen out of 18 different types collected by the bees remain to be identified. During 17 observation days throughout the summer, of the total of 31,175 samples of pollen collected, 977 were collected at the 8.45 observation hour, 2,012 at 9.45, 4,640 at 10.45, 7,456 at 11.45, 9,385 at 1.10, 4,205 at 2.10, and 2,500 at 3.10."

Frank E. Todd and George H. Vansell, of the Pacific Coast Bee-Culture Field Laboratory, Davis, Calif., "made a trip to the mountain region bordering the San Joaquin Valley," reports E. L. Sechrist, "making final observations and weighing up the colonies which had been used in the preliminary work this spring in the buckeye territory. At this time the Carniolan crosses show up more favorably than earlier, as with few exceptions they seem to have completely recovered from the poisoning and have not only built up into good colonies but have stored a surplus of 1 or 2 supers of dark honey--or honeydew. The Caucasian crosses have continued to deteriorate."

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